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GENETIC RELATIONSHIPS OF *PAPILIO INDRA* AND *PAPILIO POLYXENES*

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Clarke and Sheppard (1955) have suggested that *Papilio indra* Reakirt and its subspecies may have been isolated from the other North American members of the *Papilio machaon* complex longer than the latter have from each other. This assertion was based on the dissimilarity in genitalia, the lack of marked sexual dimorphism, and the fact that several subspecies have evolved. To date, the genetic relationships between *P. indra* and other *P. machaon*-like forms have not been examined. The present paper discusses the results of crosses between two California *P. indra* subspecies and *P. polyxenes* from the eastern U. S.

THE CROSS ♀ *P. POLYXENES* X ♂ *P. INDRA FORDI*

On April 30, 1962, larvae of *Papilio indra fordi* were collected on *Cymopterus panamintensis* var. *acutifolius*, at Cottonwood Canyon near Cottonwood Spring, Joshua Tree National Monnment, Riverside County, California. From the pupae obtained, a male emerged on February 11, 1963. A female *P. polyxenes* emerged on February 16 from a pupa from stock collected by Mr. Kent Wilson at Lawrence, Kansas, in the fall of 1962. The *P. i. fordi* was hand-paired with the *P. polyxenes* on February 17, and copulation lasted 47 minutes. The female *P. polyxenes* was confined over *Foeniculum vulgare*, and laid 52 eggs. All eggs showed characteristic fertility change (the embryo visible as a reddish-brown band around the egg.) However, only two darkened; of these two, one hatched. The larva appeared to be very weak, and moved around with difficulty. Two hours after hatching it died, failing to nibble at *Foeniculum* and *Tauschia* which were offered to it.

THE CROSS ♀ *P. INDRA PERGAMUS* X ♂ *P. POLYXENES*

A female *Papilio indra pergamus* emerged February 14, 1964, from a pupa sent by Mr. Stan Dvorak, ex larva from Tecate Peak, San Diego County, California. This female was hand-paired the same day to a 24-hour-old *P. polyxenes* male, which emerged from a pupa obtained by Mr. Robert Colborne at Columbus, Ohio, in 1963.

Copulation lasted 68 minutes (approximately the usual time for *P. polyxenes* X *polyxenes* pairings). Only four eggs were laid, and there was no fertility change.

DISCUSSION

The assertion (Remington, 1960) that imaginal color patterns are poor phylogenetic indicators in many *Papilio* seems to be applicable to these two black *Papilio* species, *indra* and *polyxenes*. From a genetic standpoint, the two southern California subspecies of *P. indra* are apparently quite distinct from the eastern *P. polyxenes*. The data of Clarke and Sheppard (1953) indicates that F_1 hybrid adults can be obtained from crosses between *P. polyxenes* and *P. brevicauda, P. zelicaon,* and *P. machaon.*

SUMMARY

1. The cross ♀ *P. polyxenes* X ♂ *P. indra fordi* showed high egg fertility, but only 4% of the eggs indicated late larval development. The one hatched larva was weak and died within two hours.

2. The cross ♀ *P. indra pergamus* X ♂ *P. polyxenes* gave no fertile eggs.

3. The results may indicate a rather distinct genetic relationship between these two *P. indra* subspecies and *P. polyxenes.*

LITERATURE CITED

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